

REMARKS

In the Office Action of March 3, 2005, the Examiner has rejected claims 1, 6-11 and 15 under 35 USC §102(b) as being anticipated by Ashiwake et al. Claims 1-5 and 13-15 are rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Molivadas. Claims 1, 6, 7, 9 and 15 are rejected under 35 USC §102(e) as being anticipated by Nakano et al. Claim 12 is rejected under 35 USC §103(a) as being unpatentable over Ashiwake et al. Claims 13 and 14 are rejected under 35 USC §103(a) as being unpatentable over Ashiwake et al in view of Miyamoto et al. Claim 16 is also rejected under 35 USC §103(a) as being unpatentable over Ashiwake et al in view of Vukovic et al or Yano.

The Office Action of March 3, 2005, has been carefully considered and by this amendment, entry of which is respectfully requested, claims 1-16 remain in the application, as originally filed.

The test for determining if a cited document anticipates a claim, for purposes of a rejection under 35 USC §102, is whether the cited document discloses all of the elements of the claimed combination, or the mechanical equivalents, functioning in substantially the same way to produce substantially the same results. As noted by the Court of Appeals of the Federal Circuit in Lindemann Maschinenfabrick GmbH v. American Hoist and Derrick, 221 USPQ 481, 485 (1984), in evaluating the sufficiency of an anticipation rejection under 35 USC §102:

"Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim."

Furthermore, it is noted in MPEP Section 706 that the standard of patentability to be followed in the examination of a patent application is that which was enunciated by the Supreme Court in Graham v. John Deere, 148 USPQ 459 (1966), where the Court stated:

"Under Section 103, the scope and the content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved."

Independent claim 1 of Ashiwake requires that "a plurality of semiconductor devices are so mounted in said container as to be dipped in said refrigerant flowing from said inlet port to said outlet port". Independent claim 7 of Ashiwake et al requires "at least one semiconductor devices is so mounted in said container as to be dipped in said refrigerant flowing". It is clear that the intent of Ashiwake is to have the semiconductor devices to be cooled dipped or submerged in the refrigerant.

Independent claim 1 of the present application requires the use of a "cold plate evaporator device" which provides cooling to the devices being cooled without the need for the device to be dipped in the refrigerant. Heat is conducted through the wall of the cold plate evaporator device to the evaporating refrigerant. This greatly simplifies the electrical connections to the semiconductor devices since there are no wires or electrical connections going in or out of the container as would be needed Ashiwake '807.

A further difference between the cited Ashiwake patent and the pending application occurs in the method of heat transfer between used by Ashiwake as compared to that used by the subject application. Being dipped in refrigerant, as is required in Ashiwake, implies a low velocity refrigerant fluid and consequently pool boiling or at least low heat transfer coefficients of the refrigerant around the semiconductor device to remove the heat.

This is quite distinct from the cooling system of the subject application which uses a "cold plate evaporator device" to remove heat from the devices to be cooled

by forced convection boiling. Forced convection boiling caused by the pumping of refrigerant past a heated surface has much higher heat transfer coefficients than pool boiling heat transfer coefficients. This is very important when heat must be removed from a semiconductor device efficiently and by a compact heat transfer device.

Since Ashiwake et al does not disclose all of the elements in independent claim 1 of the present application, , and the differences between the subject application and the cited art are clear, Ashiwake et al cannot possibly anticipate or obviate the claimed subject invention.

In considering the Molivadas patent, the additional volume 7 is denoted as a “receiver”. To a person skilled in this art, a receiver is used to protect a vapor compressor from any liquid entering the compressor and causing damage. Molivadas shows a receiver volume 7 in figures 1, 3, 26 and 50, but *not* in figures 9 or 37. Molivadas does *not* teach the use of a cold plate evaporator device to cool electronic components.

Comparing Molivadas with the cooling system of the present invention, independent claim 1 of the present invention requires a “cold plate evaporator device in thermal contact with the at least one component” to be cooled. Further, claim 2 of the subject application states that the “additional volume is contained in the cooling system to provide for storage of liquid refrigerant when liquid refrigerant is displaced in the cold plate evaporator and the condenser by vapor during the cooling operation”. This is clearly not the intent of the Molivadas volume 7 since there is no mention of volume displaced by vapor in a cold plate evaporator when cooling electronic or semiconductor devices.

Molivadas further does not teach the cooling of electrical and electronic components as evidenced by the requirement in Molivadas claim 1 where “comprising means for ensuring...at least two refrigerant evaporation rates differing significantly from each other” is stated. In cooling electric and electronic devices it is desired to have high

uniform evaporation rates at essentially isothermal conditions for all devices.

Since Molivadas does not disclose all of the elements in independent claim 1 of the present application, and the differences between the subject application and the cited art are clear, Molivadas cannot possibly anticipate or obviate the claimed subject invention.

The Examiner has also rejected independent claim 1 of the subject application as being anticipated by Nakano et al. The pending application teaches in independent claim 1, two significant differences from Nakano. First, independent claim 1 of the pending application claims “a vaporizable refrigerant circulated by the refrigerant pump to the at least one cold plate evaporator device, whereby the refrigerant is at least partially evaporated by the heat generated by the at least one component”. By partially evaporating the refrigerant, it assures that at least some liquid refrigerant remains in the cold plate at all times so that no dry out occurs. Dry out is the situation where only a refrigerant vapor exists at a heat transfer surface in the cold plate. This situation can cause hot spots and eventual device failure. By only partially evaporating the refrigerant in the cold plate evaporator device, there is always excess capacity to remove heat from the device to be cooled, so as to handle any operating conditions which cause thermal dissipation to occur in excess of design conditions.

A second significant difference between the pending application and Nakano is that the independent claim of the pending application requires “a condenser for condensing the partially evaporated refrigerant vapor, creating a single liquid phase”. Nakano does not teach the need for the condenser to accept two phase or partially evaporated refrigerant vapor at the inlet to the condenser. In the Examiner’s language, the condenser causes the vapor to cool “resulting in a change in phase from vapor refrigerant to the liquid refrigerant.” Independent claim 1 of the pending application emphasizes the partially evaporated refrigerant leaving the cold plate evaporator device and entering the

condenser.

Since Nakano does not disclose all of the elements in independent claim 1 of the present application, Nakano cannot possibly anticipate the claimed subject invention.

Even if one were to combine the teachings of any of Ashiwake et al and/or Molivadas and/or Nakano and/or Miyamoto et al and/or Vukovic et al and/or Yano, the present invention would not be the result of any such combination. None of the cited references teach, anticipate or render obvious the cooling system claimed by the present invention. None of the cited art, taken singularly or in combination, disclose a cold plate evaporator device or the related components, applied in the same manner as the pending invention, and particularly not in the combination claimed in the subject application.

In light of the remarks herein, it is submitted that the cited art, whether taken singularly or in any combination, does not teach, anticipate, or render obvious the invention of Applicant.

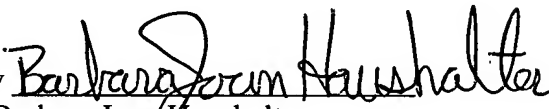
Claims 2-16 depend from independent claim 1, to contain all of the limitations found therein. By this dependency, it is submitted that claims 2-16 are not anticipated, taught, or rendered obvious by the cited documents. Additionally, these claims add further limitations which distinguish them patentably from the cited documents. Accordingly, withdrawal of the rejection of claims 1-16 under 35 USC §§102(b) and (e), and 103(a), is respectfully requested.

In view of the foregoing remarks, the undersigned attorney respectfully submits that all of the claims of the application are clearly allowable. Therefore, Applicant's attorney respectfully requests that the Examiner's rejections be withdrawn and that a formal Notice of Allowance be issued thereon.

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If it is believed that an interview would serve to facilitate prosecution of the present application, the Examiner is requested to contact the undersigned attorney. Should the Examiner have any questions with respect to any matter now of record, Applicants attorney may be reached at (937) 592-8603.

Respectfully submitted,

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